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Bezzi (M.). **Altre *Ceratitis* africane.** [Further African *Ceratitis*.]—*Boll. R. Scuola sup. Agric. Portici*, vii, 10th Feb. 1913, pp. 19-26.

This is a systematic description of certain species of *Ceratitis*, reared by Professor Silvestri from various fruits in Konakry, French Guinea, and in Lagos, Southern Nigeria.

Ceratitis anonae, Graham, bred at Lagos, from the fruit of *Spondias lutea*, originally described from Southern Ashanti, as feeding on *Anona muricata*.

Ceratitis stictica, Bezzi, from the Belgian Congo, Southern Ashanti and Lagos; also a new variety, *antistictica*, from Lagos.

Ceratitis giffardi, from Lagos and Konakry, from the fruit of *Sarcocephalus esculentus*. Silvestri also obtained from Konakry, from the same fruits, a number of specimens of a fly, belonging to the family Lonchaeidae, which Prof. Bezzi regards as *Lonchaea glaberrima*, Wied. The African specimens are, he says, identical with others obtained from Brazil, where this species does great damage to various kinds of fruit. The question as to whether the fly was imported from the Brazils to Africa, or whether Africa is its native country, is difficult to determine.

Ceratitis tritea, Walk., Lagos, feeding upon a native fruit, species not known; originally described from Sierra Leone.

Ceratitis nigra, Grah., var. *nigerrima*, nov., feeding on an undetermined species of native fruit at Lagos.

Report on Insect Pests in Barbados.—*Agric. News, Barbados*, xii, 15th Feb., 1913, pp. 58-59.

The report of the Local Department of Agriculture for 1911-12, is published as a supplement to the Official Gazette, 24th January, 1913.

A scale-insect, new to the West Indies, is reported to have been discovered on cacao plants from St. Lucia. This insect, *Pseudaonidia (Aspidiotus) trilobitiformis*, was previously recorded from Brazil, and from several Asiatic localities. The following fungi, parasitic on scale-insects, are recorded: *Cephalosporium lecanii* (shield-scale fungus), *Sphaerostilbe coccophila* (red-headed fungus), and two others not yet satisfactorily identified. *Vinsonia stellifera* (glassy star scale) has been found to be attacked by a fungus, probably belonging to the genus *Aschersonia*.

Heliothrips rubrocinctus, Giard, the cacao thrips, is recorded as having reached the island on leaves of grape vine, mango, and croton. *Euthrips insularis*, Franklin, is reported on rose trees, and on bonavist. Another species of *Euthrips* occurred on sweet potatoes, and *Heliothrips haemorrhoidalis*, Bouché, on fiddle-wood (*Citharexylum quadrangulare*).

A mite which sometimes occurs in large numbers on the young internodes of sugar cane, whilst these are still enclosed in the sheathing leaf, has been under observation during the past year.

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This mite causes the surface of the cane and the edges of the leaf-sheath to become covered with quantities of minute blisters. It has been described as *Tarsonemus spinipes,* Hirst, and is fairly common in several of the West Indian Islands.

The larvae of a rove beetle (STAPHYLINIDAE) have proved useful in keeping down the attack of the red spider on sweet potatoes. The natural control of *Aphis* on melons by ladybirds and Hymenopterous parasites is also recorded.

The cotton leaf blister mite was discovered in Barbados in February 1912 for the first time. An area of about two miles wide and 6 miles long, to the north of Bridgetown, was more seriously infested than any other district, although two miles or more from the point of discovery. How this pest was introduced is not known, but the manner in which it has spread lends colour to the supposition that it has been brought by birds.

Diaprepes abbreviatus and *Phytalus smithi* are recorded as attacking sugar-cane. With regard to the former it has been found that when the larvae are deprived of food, by digging the cane-stumps after the crop is reaped, they penetrate deeper into the soil, and there construct an earthen cell in which they lie dormant for some time, and that after three months they are still alive, and capable of resuming feeding when opportunity offers. The eggs are found to be laid on the cane leaf, near the tip, where it has been split by the action of the wind. The two adjacent portions are brought into contact, and their surfaces stuck together by an adhesive substance, deposited by the female insect. The eggs are thus well protected. The collection of the beetles is thought to be the most effectual means of keeping down this pest, and it is recorded that during one week over 9,600 were captured on one estate. The practice of reaping infected canes early, followed by the immediate removal of the cane-stools, and a rotation of crops is recommended as a useful control measure. The Report says that it is only when the root-borer is present in some abundance, that it can be regarded as a serious pest, and where it becomes numerous, it can undoubtedly be checked if trouble be taken to do so, though it may involve some deviation from estate routine.

A black wasp of the family SCOLIIDAE, *Tiphia parallela*, Smith, is exceedingly abundant, and is found to be parasitic on *Phytalus smithi*, which probably accounts for the fact that *Phytalus* is not a pest of consequence in Barbados, whereas in Mauritius, where the beetle has been introduced without the parasite, it is a very serious pest of sugar-cane.

RUSSELL (H. M.). **The Red-Banded Thrips.**—*U.S. Dept. Agric., Bureau Entom.*, Bulletin no. 99, pt. 2, 14th Dec. 1912, 29 pp.

For about 12 years the Red-banded Thrips (*Heliothrips rubrocinctus*, Giard) has ranked as an important insect pest of cacao in the West Indies, where it is known as the Cacao Thrips. It has recently obtained a foothold in Florida, where it is attacking

principally the mango and the avocado pear. The author uses the term Red-banded Thrips because the term Cacao Thrips is scarcely applicable in a country like the United States in which cacao is hardly grown. The insect was first described in 1901 from Guadeloupe, and Urich in 1910 recorded it as feeding on cacao, guava, roses, almonds and mangos in Trinidad. In 1911 it was reported by Higgins to be injuring mango seedlings in the greenhouses of the Agricultural Experiment Station in Hawaii, and in 1912 it has been found on mango plants received in U.S.A. from Mauritius. Damage to the mango leaves is done by adults and larvae in the same way. They first pierce the epidermis and then scrape out the leaf tissue below, leaving a minute spot where this has been removed, which becomes brown. When there is a large number of these spots they run together, forming large brown patches near the main or side veins, and the leaves turn brown and dry up. In severe cases the whole leaf surface is entirely destroyed. It has not yet been observed to attack the fruit, but it is quite possible that as it attacks the pods of cacao it may attack the fruit of mango and avocado. The eggs require 15 or 16 days for incubation, though this varies considerably with locality and temperature. In Trinidad the larva develops in 6 days; in Florida this requires 6 to 20 days. Urich found the pupal stage to last from 2 to 6 days. In Trinidad the life-cycle from the time of hatching, with an estimate of 4 to 6 days for the egg-stage, until the appearance of the adult, is approximately 16 to 18 days; in Washington from 28 to 43 days; in Florida 20 to 43 days and possibly longer. It is estimated that 10 generations per annum are possible in Florida.

The author has not observed any natural enemies of this Thrips and says that the heavy summer rains that occur in Florida are the chief agents in its destruction. A spray made of one part of black leaf tobacco extract containing 40 per cent. nicotine to 1,500 or 2,000 parts of water, with 1 pound of whale-oil soap to every 50 gallons, has been found to give very good results. A more or less complete bibliography concludes the article.

PRIEGO (Juan M.). **The present condition of Citrus growing in Spain.**—*Mthly. Bull. of Agric. Intell. and Plant Diseases, Int. Inst. Agric. Rome,* iv, no. 2, Feb. 1913, pp. 161-166.

The author says that the list of pests which infest the Spanish orange-groves with greater or less intensity is a long one, but that the following are the most important:—*Chrysomphalus dictyospermi*, Mask. ("piojo rojo"), *Mytilaspis citricola*, Pack. ("serpeta"), *Dactylopius citri*, Risso ("cochinilla algodonosa"), and *Aspidiotus hederae*, Vallot ("piojo" or "cochinilla blancos").

The first of these is the most important, owing to its prevalence and the damage it does. The agricultural associations and Government inspectors have organised a campaign against this

scale, which began to be effective as soon as hydrocyanic acid fumigation was taken up, and the worst attacked provinces were provided with the necessary staff and appliances for the work. The Committee of "ingenieros agronomos" to whom the work was entrusted has now 32 tents and an efficient staff of trained men.

PEREIRA (S. do M.). **Reconstitution of Portuguese Vineyards by means of American Stocks.**—*Mthly. Bull. of Agric. Intell. and Plant Diseases, Int. Inst. Agric., Rome,* iv, no. 1, Jan. 1913, pp. 3-7.

The author in describing the struggle against *Phylloxera* in Portugal says that it was introduced about 1872 by some French stocks planted in a vineyard in Douro, and that the pest was for a fairly long time limited to that district. Planting in sandy soil was practised and there are still important vineyards on the sands of the coast and of the interior. In the great vineyard of José Maria des Santos, which the author says is possibly the largest vineyard in the world, the greater proportion of its area is sandy soil covered with ungrafted vines. The land was broken up by steam before planting, and this operation brought to the surface a clayey sub-soil in places near the middle of the vineyard. The whole of the vines planted on these parts of the estate died of *Phylloxera* in a short time, those on the sandy soil resisting.

The clayey areas were re-planted with American stock. If those plantations be excepted, that is to say, those of ungrafted vines that are protected by flooding or by their situation on sandy soils, it is difficult, the author says, to find vineyards which are not completely infested by *Phylloxera* in Algarve.

Miscellaneous Insect Notes.—*Connecticut Agric. Expt. Station,* Report for 1912, pt. iii, 1913, pp. 291-296.

A Gall Beetle of Hop Hornbeam, first noticed in 1911 has been investigated and found to belong to the genus *Agrilus* (BUPRESTIDAE) and has been named *Agrilus champlani.* The Spruce Bud Moth (*Tortrix fumiferana,* Clem.) was unusually abundant in 1912. The larvae of this moth are reported from other States to have done a great deal of damage, defoliating and ultimately killing the spruce trees. In the case of ornamental and shade trees a spray made of 5 lb. of lead arsenate in paste, or 1½ lb. dry, to 50 gall. of water has been found useful. A Chrysomelid beetle has been discovered in English ivy, imported from Holland, and identified as *Agelastica* (*Galeruca*) *alni,* L. This insect has been reported as skeletonising the leaves of various species of alder in Europe. The Southern Cabbage Butterfly (*Pieris protodice,* Boisdv.) is not common in Connecticut, but specimens have recently been taken. *Tolype velleda,* Stoll, the larvae of which feed upon apple, pear, cherry, maple, oak,

willow, poplar, and lilac, was unusually common in Connecticut in 1912, though the damage done by them is possibly hardly sufficient to cause them to be regarded as pests, at least at present.

The Elm Sawfly, *Cimbex americana*, was somewhat abundant in 1912. Spraying with lead arsenate is regarded as the proper treatment for trees. The potato aphis, *Macrosiphum (Nectarophora) solanifolii*, Ashm., has been found on maize as well as on potatoes. For several years this aphis has done considerable damage in neighbouring states to the potato crops. Spraying with kerosene emulsion is useful, but only practicable for small areas. The Tulip Tree Scale, *Toumeyella liriodendri*, Gmel., the largest scale-insect in the U.S.A., is doing increasing damage, sometimes killing the lower branches of tulip trees and afterwards invading the higher ones. The proper treatment is to spray with kerosene emulsion during the latter part of September, which kills the young scales. The Juniper Web-Worm, *Phalonia rutilana*, Hübn., has been found attacking red cedar and is a somewhat widely distributed pest. Spraying with lead arsenate will probably prove of service in the case of ornamental trees or shrubs. Ash trees have been badly damaged by a small mite, identified as *Tetranychus bimaculatus*, Harv., and chrysanthemums by another mite, *Tarsonemus pallidus*, Banks.

Sasscer (E. R.). **The Genus *Fiorinia* in the United States.**—*U.S. Dept. Agric., Bureau Entom.*, Tech. Ser. no. xvi, pt. 5, 6th Dec. 1912, pp. 75-82.

The author says that there are only two species and one variety of *Fiorinia* established in the United States, viz., *Fiorinia fioriniae*, Targ., *F. theae*, Green, and *F. fioriniae japonica*, Kuwana. He is certain that the first two of these Coccids were imported on ornamental plants, whilst the last-named variety has reached the United States from Japan and has only established itself in one State. It is believed that *F. theae*, Green, was originally introduced on *Camellia japonica* and that it now shows decided preference for the tea-plant. In the United States it is known on Camellias in Alabama, Columbia, Florida, Georgia, Louisiana, and North and South Carolina, where it is not infrequently associated with *Lepidosaphes lasianthi*, Green. The following have been described as its natural enemies:—Two Coccinellids, *Chilocorus bivulnerus*, Muls., and *Microweisea misella*, Lec., and a Nitidulid, *Cybocephalus nigritulus*, Lec. *Fiorinia fioriniae*, Targ., is known practically all over the world and is of common occurrence on Kentias in greenhouses; a lengthy list of food-plants is given. The red-headed fungus (*Sphaerostilbe coccophila*) is recorded from Mauritius as attacking this Coccid on Camellias.

Fiorinia fioriniae japonica, Kuw., appears to have been obtained chiefly from imported plants at the quarantine stations.

A description of the insects and a bibliography is given in each case.

Chittenden (F. H.). **The Potato-Tuber Moth** (*Phthorimaea operculella*, **Zell**).—*U.S. Dept. Agric., Bureau Entom.*, Circular no. 162, 4th Dec. 1912, 5 pp.

This moth has been for many years the worst potato pest in California. It has now reached the State of Washington and threatens to invade adjacent States. It also feeds upon the tomato, egg-plant and tobacco, though not as a rule doing much damage to these. It is known to tobacco-growers as "split worm." Two generations are generally produced in nature in the course of the summer and it is certain that a third can be produced in store. It is well-known in Hawaii, all over Australia, New Zealand, and Algeria, and many other countries including southern Europe, and though there may be some doubt as to whether it is absolutely identical with the species infesting tobacco, it has long been known to tobacco-planters in Florida, the Carolinas and Virginia. The amount of damage done is at times very serious. Two growers alone near El Monte, Cal., are reported to have lost $90,000 and $70,000 respectively last year. The moth is exceedingly difficult to control, as the larvae cannot be reached in their burrows in the potatoes in store or in the stalks or tubers growing in the fields. Clean methods of cultivation are very necessary. All infested potato plants and Solanaceous weeds must be carefully destroyed by fire. Sheep and pigs are also valuable if turned into the potato-fields with proper precautions. Crop rotation, as in many other cases of insect injury, is very desirable and the co-operation of all potato-growers in the neighbourhood is practically a necessity. It might even be found necessary to prohibit by law the planting of any potatoes over a large area for one year and to require at the same time the destruction of all weeds likely to harbour the pest. The alternate food-crops which do not suffer materially from the attack of this insect are peas, beans, cow-peas, alfalfa, and clover. Sugar-beets, celery, and crucifers may also be used. Grain is not attacked by the moth and is therefore useful for rotation. The greatest care is required in digging the crop of potatoes, that none should be left in the ground; they should not even be left in the field over-night. The best remedy appears to be fumigation in closed chambers with bisulphide of carbon or hydrocyanic acid. The author recommends 3 pounds of bisulphide to every 1,000 cubic feet of potatoes and says that 1 ounce to a barrel of 96 pounds capacity is not excessive. The exposure, whether in the chamber or in the individual barrels should last at least 24 hours.

Insects Injurious to Garden Crops in France.—*Bull. Soc. Nat. d'Acclimatation*, no. 5, 1st March 1913, pp. 152-155.

Members of the Society reported damage to garden peas, by a black and green aphis, *Thielavia pisicola*, and that the methods hitherto used for controlling it have not yielded any appreciable

result; there is considerable fear that the cultivators in the neighbourhood of Rouen may suffer very seriously from its ravages.

Tetranychus major, which is regarded as a specific parasite of the lime tree (linden), has, in the past year, done enormous damage to avenues in Maisons-Lafitte, Saint-Germain-en-Laye, and Melun. Spraying with nicotine solution, or soapy emulsion of petroleum, is said to be thoroughly effective.

Potatoes in the South of France have been very seriously damaged during the past two years by *Phthorimaea solanella.* Damage by this insect in France is said not to have been previously recorded. The species is known in Algeria, where it does a certain amount of damage to the early potatoes, but it is never serious because the climate is not suitable for storing them. It is found, in France, that if the potatoes are stored in as dry a place as possible, and covered completely with a fairly thick layer of sand or of light soil, the attack of the insect is prevented, but care must be taken to keep them covered, otherwise the eggs are laid at once on the exposed potatoes.

Holloway (T. E.). **Insects liable to Dissemination in Shipments of Sugar-Cane.**—*U.S. Dept. of Agric., Bureau of Entom.,* Circular no. 165, 27th Dec. 1912, 8 pp.

The danger of disseminating injurious insects by the transport of sugar-cane is of two kinds, (*a*) the importation of new pests from other countries, and (*b*) the transport of a local pest from one part of the country to another. The detection of insect pests in sugar-cane at the port of entry is not easy, as there may be borers within the cane which cannot be detected unless the stalks are cut open and consequently spoiled. Fumigation by poisonous gases appears to be very unreliable in the case of sugar-cane, as these do not penetrate the stalk. Experiments as to the value of dipping the cane in certain solutions are in progress.

Amongst the insects liable to be imported are, *Castnia licus,* Drury, the larger moth-borer, a native of South America, extending northward to Mexico and well-known in Trinidad; and the weevil borers, known in the West Indies and probably in South America and Mexico. These have been found in experimental gardens in Texas and New Orleans and elsewhere. Frog-hoppers are a great pest in Trinidad and a species has been discovered near New Orleans, but not yet described, though it is known not to be the species common in Trinidad. There are apparently several Leaf-hoppers in the United States, but they do not appear to be injurious. *Perkinsiella saccharicida,* Kirkaldy, was accidentally introduced from Queensland into Hawaii, and it is possible that it may be brought from Hawaii to the United States, more especially after the opening of the Panama Canal. *Pseudococcus sacchari,* Ckll. (Pink Mealy-bug) is not known to occur in the United States, but is common in Cuba, Porto Rico, and in South America. *Scapteriscus didactylus,* Latr., the West-Indian Mole Cricket, is very destructive in the West Indies and especially in Porto Rico and South America.

The following insect pests of sugar-cane are found in the United States:—*Diatraea saccharalis*, F. (Sugar-cane Moth-borer) has probably been introduced from the tropics, though the time of its introduction is uncertain. The injury done by the larvae in the early spring is known as "dead heart" and consists in the decay of the tender shoot of the young plant. It destroys a large percentage of the "eyes," thus reducing the stand of plant cane. It stunts the growth of the cane and affords an opening to fungus diseases through wounds in the stem; it is also the chief cause of injury to plantations by wind, as the weakened canes are unable to resist. The distribution of the moth-borer seems to be limited to the southern half of Louisiana and the lower Rio Grande Valley in Texas. There are a number of sugar-growing districts within this area in which, however, it is not as yet known.

Pseudococcus calceolariae, Mask. (Grey Mealy-bug), called in Louisiana "pou-a-pouche." It is believed that this insect was imported into southern Louisiana about 28 years ago. It is at present limited to a certain area in this State and especially to plantations along the Mississippi River, but it has been found also at the experiment station at Brownsville, Texas. A sugar-cane Aphidid has been found during 1912 at a number of places in southern Texas. It appears to be a new species and is not known to many sugar-planters. There is very little information at present about it.

The author concludes with a statement that the principal insects injurious to sugar-cane in the United States have been practically all inadvertently introduced from the tropics, and that the most extraordinary efforts are justified to prevent the introduction of other pests.

Morstatt (H.). **Bemerkungen zur Kultur und den Krankheiten des Kaffee am Meru.** [Notes on the Cultivation and Diseases of Coffee in Meru, German East Africa.]—*Der Pflanzer*, ix, pt. 2, Feb. 1913, pp. 63-77.

Coffee is steadily becoming the most important crop in Meru in consequence of the favourable conditions of soil and climate. The injurious insects and diseases which attack this crop are for the most part already known and are in general only such as affect young plantations. The coffee borer (*Anthores leuconotus*) and the coffee bug (*Antestia variegata*) are the only pests which demand serious attention, and these have been more or less successfully kept down, the loss from their operations being reduced to a minimum.

The local conditions of rainfall, position of the plantations, nature of the soil, and the excessive cost of the transport of manure, necessitate certain special methods of cultivation, and the use of shade-trees (especially Grevilleas), which have an important bearing upon the attack of insect pests. The coffee grown in shade is less exposed to their attack, and this applies not only to the smaller insects, such as scales and aphides, but the

danger of the spread of the coffee borer and the coffee bug is said to be greatly diminished. The effect of shade in mitigating the ravages of the coffee bug has been observed in Usambara and in Aruscha; the author further says that the development of *Hemileia vastatrix* is notably less in shaded than in unshaded plantations. The fallen leaves of the Grevilleas also keep down weeds, which might serve as food-plants for noxious insects, and in other ways diminish the cost of upkeep of the plantations. The pruning of the older trees is an operation requiring care and should be directed to the removal of all vertical and interlacing branches. The attack of the coffee bug renders its execution difficult by causing the death of buds and small shoots, with the consequent production of numerous adventitious buds; the trees become unduly bushy and it is exceedingly difficult to bring them back to the proper shape.

As stated above, most of the coffee pests in Meru are those which attack only young trees and which tend to disappear as the trees grow older; this has also been observed to be the case in Usambara. The author, however, lays stress on the fact that many of these insects are but little known and that planters should collect and send them for identification as often as discovered.

Termites are common in all plantations and after rain often build mounds round the trunks of the coffee trees, but, as a rule, confine their attention to the old bark, though the author has met with cases in which they have gnawed the living bark of the tap-roots of young trees and caused their death. Repeated drenching of such nests with water has been found to be very effective, and the heaping of wood-ashes round the trunk prevents the attack. The common species is *Termes badius*. Only two species of leaf-miners have been observed, the mining flies whose burrows chiefly destroy the old leaves and the coffee moth, *Leucoptera (Cemiostoma) coffeella*, Guér.,* which, though occasionally very plentiful in some localities, has not as yet done any serious damage. The round brown spots on the leaves in which the larva lives are easily distinguished from other leaf-spots in that the epidermis covering them is dry and if the leaf be bent it cracks off.

The small caterpillars of *Thliptoceras octoguttale*, Feld., (the coffee Pyralid) are found everywhere and often do serious damage, attacking the flower-buds, the unripe berries and the tips of young shoots; they may readily be tracked by their excrement. The damage to the flower-buds is serious, and when the bunch on one internode is destroyed the larvae proceed to the next. The berries are bored close to the stalk and the unripe beans gnawed. Shoots are attacked from the tip and the caterpillar eats its way downwards through the heart of the shoot, which withers and dies. The only remedy which the author can suggest against this pest is the removal and destruction of all bunches of buds which show signs of attack, care being taken to cut them low

* [If the determination is correct (and the species of this genus are often extremely difficult to distinguish) the occurrence of this moth in Africa is noteworthy, for according to Mr. J. H. Durrant there is no authentic record of it outside the West Indies and Tropical America.—Ed.]

enough to make sure of taking the larva in its burrow. The cocoons of a Limacodid moth of the genus *Miresa* were frequently observed by the author on the stems of the coffee trees, but not in sufficient numbers to be regarded as a pest. The young plantations are however seriously damaged by a cutworm, and occasionally the greater part of the newly planted coffee is destroyed by it. Small deep holes are gnawed in the neck of the tap root and the stems wither and die. Being night-feeders these caterpillars are difficult to observe; they do the largest amount of damage during the first and second years and in the months of August and September, but disappear entirely when the trees grow older. Drenching the roots with water or piling wood-ashes against them is useful at the time of attack, but the better plan is to endeavour to clear the land of them by hoeing or ploughing and so exposing the caterpillars to the attack of birds; direct collection by hand is worth the labour. A black beetle which gnaws the stem just above the ground occasionally does much damage; the holes are not circular, like those made by the cutworms, but about 2 cm. broad; sometimes these holes are observable 30 cm. up the stem and this is never the case with the cutworm. The result is very much the same; the young trees wither and die and even if earthed up few seem able to recover themselves. This beetle has not yet been sufficiently observed, but a specimen sent to the author proved to be a Tenebrionid; it usually appears from March to May, after the planting out and after the rainy reason, and then disappears entirely. As it cannot fly, it ought to be found in the planting holes; it is never found on old trees. An as yet undiscovered pest, either a caterpillar or a beetle, eats the young plants in the seed-beds, working only at night.

The worst enemy of the coffee plant is the white coffee borer, *Anthores leuconotus*. In the Kilimanjaro district it has now been found in Kibongoto and Mamba and in three plantations in Meru. In plantations on high ground in the neighbourhood of forests special care must be taken to prevent attack, as there is little doubt but that the insect passes from the forest to the coffee, as it has not yet been found in those plantations which are surrounded by prairie or by more or less dense bush. Whenever it makes its appearance it must be combated without remission. The best time for cutting out the larvae is from September to December, as during this period most of the larvae have done their work in the bark and are boring into the stem. In Meru the natives have learned to recognise the larvae in this stage and appear to be able to find them without difficulty. Perhaps the dryness of the climate has something to do with the visibility of the holes, for this is rarely the case in Usambara. The larvae are either cut out, or dragged out or killed with a hooked wire, and as the natives are paid a small fee for catching them they frequently collect larvae in the neighbouring forests, generally not those of the coffee borer. The author remarks that it would be money well spent if in this way the food-plants and habits of the coffee borer in the wild state could be discovered. When the larvae have bored into the stem beyond the reach of the hooked wire, the saw or bill-hook must be used to lay bare the burrows;

new burrows are then often found. If the larva has attacked the tap root, or even the main roots, a condition often found in Meru, the tree should be cut down and burned.

In only one case did the author come across the Anthribid borer *Phloeobius catenatus*, Kolbe, already reported from Nduruma. Leaf-eating beetles were more or less abundant, among them a weevil, *Systates pollinosus*, Gerst., and another bluish leaf beetle. The coffee bug, *Antestia variegata* var. *lineaticollis*, is fairly distributed in Meru, and on some plantations has done serious damage, though for the present its activities have diminished. The effect of the attack is plainly visible in the number of adventitious buds and the generally bushy habit of the tree; as a result few flower-buds are formed and the yield of fruit is insignificant. The period from January to March is that at which the attack reaches its maximum and in which also the most fruitful results of operations against the pest can be obtained. The collection of the bugs and their eggs by women and children pays well in small plantations, and especially when they appear in large numbers. Spraying has not yet been sufficiently practised in Meru to enable an opinion to be formed as to its value. Both petroleum emulsion and arsenical solutions have been found to burn the leaves, although effective against the bugs. The author thinks the solutions were probably used too strong and at the wrong time of day. He gives the following formulae:—

(1) *Tobacco solution*.—Tobacco leaves or stalks, 3 to 4 kilogs., well boiled in 10 litres of water; allow to stand 24 hours and strain: dissolve 2 kilogs. soft soap in 4 litres hot water; mix the two solutions and dilute with cold water to 100 litres.

(2) *Arsenical solution*.—Sodium arsenate 100 grm., sugar or treacle 1 kilog., water 100 litres.

(3) *Petroleum emulsion*.—Dissolve ½ kilog. hard soap in slices, or the same weight of soft soap, in about 5 litres of hot water; stir in 1 litre of petroleum and dilute with water to 100 litres.

(4) *Simple soap solution*.—Soft soap ½ kilog., water 100 litres.

In Meru the tobacco solution has proved highly useful against scale and aphis: the arsenical and petroleum mixtures require more care in handling or the foliage will be damaged.

Other bugs on coffee in Meru are:—A species of Pentatomid resembling, but rather larger than, the true coffee bug; another, still larger, *Callidea bohemani*, Stål, easily mistaken for a beetle, is often very numerous on some trees; *Sphaerocoris annulus* var. *ocellus*, Klug, is also not uncommon: none of these are at present regarded as pests, but the author is strongly of opinion that they should not be neglected. The black coffee aphis, *Aphis coffeae*, is increasing in the younger plantations, and would do much damage if not kept down by tobacco spray. The green scale, *Lecanium viride*, is widespread and a pest of young coffee, and in some cases the damage was serious in the first half of the year; the cutting of badly infested twigs and rubbing the twigs with the hand was found very useful, but spraying the *under side* of the leaves with tobacco solution proved the most efficacious remedy. *Ceroplastes ceriferus* and another hemispherical *Lecanium* were also found on coffee.

Hemileia vastatrix is, according to the author, to be found everywhere in the district under consideration, but the attack is so limited that no real damage has been done; this he attributes to the dryness of the climate. The fungus was not observed in very young plantations. *Hemileia* in Meru takes on a form which might prevent its recognition as such, dark patches of varying form being confined to a large portion of the point of the leaf; these patches are of a brighter brown on the under than on the upper side of the leaf.

Escherich (Prof. K.). **Die angewandte Entomologie in den Vereinigten Staaten.** [Applied Entomology in the United States.]—Paul Parey, Berlin, 1913, 196 pp., 61 figs. Price 6 marks.

This book is a report of the results of a journey to the United States, undertaken for the purpose of studying the methods there employed in dealing with insect pests, at the invitation of Dr. L. O. Howard, Chief of the Bureau of Entomology, the expenses being borne by Mr. Andrew Carnegie. After spending a fortnight in Washington in a study of the organisation of the Bureau of Entomology, the author made a tour of the United States, visiting all the more important research stations. He summarises his impressions in the preface by saying that the energy displayed in the U.S.A. in the struggle against insect pests is far greater than we in Europe, and especially in Germany, are inclined to adopt. The book is divided into three parts:—(1) An account of the organisation of the various departments of the Bureau of Entomology; (2) a description of the methods adopted, with special reference to the campaigns against the San José and other scale-insects, the cotton-boll weevil, etc.; the introduction and cultivation of various parasites and natural enemies of insect pests and the employment of mechanical and chemical remedies, spraying and fumigation. In part (3) the author under the heading, "What can we learn from America? Proposals for reform," sets out what he thinks ought to be done in Germany to bring the study and utilisation of applied entomology up to the same level as in the United States.

Applied entomology in Germany is, he says, in comparison with other sciences entirely in the background, and has been too long regarded as an unprofitable branch of knowledge, whereas the very contrary is the case. He gives a list of the principal research stations in Germany and a brief summary of the work done by them, and complains of the want in most of them of competent teachers of applied entomology and of experts in plant diseases; the instruction, though good of its kind, being for the most part in the hands of pure zoologists and botanists. In many cases he declares the personnel to be quite insufficient for the work to be done. The author seems to regard the Forestry schools of Germany as the best equipped and the most active in this direction and gives a summary of work done by them from 1907 to 1912. He makes the same complaint as regards the

German colonies, that there are but few research stations, and that the number of persons having the requisite practical knowledge attached to them is utterly insufficient and unworthy of a nation with the scientific reputation of Germany.

The importance to agriculture of a knowledge of economic entomology is such that there should be attached to every agricultural college a professor of phytopathology, with a zoological and a botanical assistant; the number of practical schools should be increased, and active steps should be taken to raise the level of the study of entomology in this connection. The Imperial Biological Institute at Dahlem could turn out a larger number of entomologists, who should be sent to and maintained in the various districts where their services are most required, after the fashion of the "Field Stations" of America. The author quotes Brauer to the effect that even the existing institutions are unable to supply the information asked for by governments, doctors, veterinary surgeons and farmers; or if they are able to do so, their very organisation causes delay and loss of time which is often such as to render the information useless when it arrives. Some well-organised method for the prompt distribution of useful entomological information is, the author says, urgently needed, as well as a large, practically informed and properly distributed personnel. He blames the pure zoologists of Germany for neglecting the practical side of their science. The author concludes with an outline scheme that after the completion of a course of pure zoology students should spend at least two terms, or better three, at an institution devoted to applied entomology, and that if possible, in addition, a visit to the U.S.A. should form part of the course, the cost of this latter to be borne by the State. He suggests the formation of a Society of Applied Entomology and has already taken some steps in that direction. An appendix of 17 pages contains a list of the more important publications of the U.S. Bureau of Entomology from which also the bulk of the illustrations are taken. The book contains a large mass of useful and well arranged information and provides an excellent summary of the subject.

Cultivation of Tobacco for the Preparation of Fruit- and Hop-Washes. —*Jl. of the Board of Agric., London,* xix, no. 12, March 1913, pp. 985-994.

The high value of nicotine as an insecticide and acaricide has long been recognised, and there can be no doubt that if it were obtainable at a sufficiently low price it would be used to an enormous extent as a constituent of washes for fruit and hops and of sheep-dips. It poisons insects and related forms having soft delicate bodies, and has the great advantage that it does not stain the material sprayed. At present commercial nicotine costs about 15*s.* per lb. which makes its use impracticable in ordinary cases. The high price is partly due to the limited supply, but also largely to the cost of preparation and purification and the fact that the manufacture is hampered by fiscal regulations. Although there is no probability of any decrease in the price of the manufactured

product, there is good reason to believe that fruit- and hop-growers could, by growing suitable varieties of tobacco in such a way as to encourage nicotine production and by avoiding altogether the elaborate and expensive system of manufacture, produce their own nicotine washes at a cost low enough to enable them to compete with the cheaper but less effective and less desirable washes in common use. By Section 4 of the Finance Act, 1912, the Commissioners of Customs and Excise for the United Kingdom may authorise duly licensed persons to grow tobacco without payment of duty for the sole purpose of obtaining extracts to be used for purely agricultural and horticultural purposes, and the Board of Agriculture think it useful to publish some general information for the guidance of any growers wishing to avail themselves of this facility. It is found that the highest percentage of nicotine and the greatest weight of tobacco per acre are obtained from rank, coarse-growing varieties, treated in such a way as to encourage their tendency to strength of growth as much as possible. A great part of the heavy expense in the production of smoking tobacco is incurred in curing, grading and packing, nearly all of which is unnecessary in the case of tobacco grown as an insecticide and especially in the case of hop-growers who have an oast at their disposal.

The recommendations given in this article are largely based on the results of experiments conducted by the South Eastern Agricultural College, Wye, Kent, during the seasons of 1910 and 1911.

The type of tobacco best suited for the purpose is said to be *Nicotiana rustica*. The percentage of nicotine in a crop is found to depend very largely upon climate, soil, manuring and system of cultivation, and apparently the tendency to produce a high or low percentage of nicotine is an inherited quality of the plant. Smoking tobaccos are generally grown with a view to a low proportion of nicotine. Outline instructions are given as to cultivation, manuring, &c.; the method of extraction of nicotine and preparation of washes is exceedingly simple and the instructions are as follows:—The leaves should be broken up as finely as possible and then treated with three successive quantities of water in the proportion of 1 gallon to 1 lb. of leaves each time. It is best to allow one day for each extraction and the result is improved if the water be warm, but in no case must it be above 140° F. or nicotine will be lost by volatilisation. It is estimated that under good conditions 4 per cent. of nicotine in the leaves is not too much to hope for; this 3 gallons of extract, if made up to 5 gallons with water, will give a solution containing rather more than 0·075 per cent. of nicotine and at Wye this was found to be effective against the hop aphis. It is advised that the percentage of nicotine in the leaves be ascertained experimentally so that the proper strength of wash may be accurately obtained.

Bussy (Dr. L. P. de). **Een Kleurmiddel voor Loodarsenat.** [A Colouring Medium for Lead Arsenate.]—*Med. Deli Proefstation, Medan, Sumatra*, vii, Jan. 1913, p. 323.

The usual method of applying lead arsenate in powder is to mix it with tapioca meal and, as there is little or no difference in

the colour of the two substances, it is exceedingly difficult to know when they have been properly and thoroughly blended. The author finds that finely powdered wood-charcoal answers the purpose admirably and suggests proceeding as follows:—Equal parts by weight of the arsenate and the powdered charcoal are first thoroughly mixed, and this mixture is then added to the requisite quantity of tapioca meal to make the quantity and strength required, being thoroughly turned over until the whole is of an even gray tint; thus if a 4 per cent. mixture is needed, 4 kilogs. of lead arsenate are first thoroughly mixed with 4 kilogs. of finely powdered wood charcoal and the whole mixed with 100 [92] kilogs. of tapioca meal.

Bussy (Dr. L. P. de). *Opatrum* en "Oelar Kawat" in Deli. [*Opatrum* and "Oelar Kawat" in Deli.]—*Med. Deli Proefstation, Medan, Sumatra,* vii, Jan. 1913, pp. 317-322.

In 1912 this insect did a large amount of damage in many tobacco plantations. Previous to that date it had not been noticed as a serious pest, though it was observed in the season of 1907-8. The *Opatrum* found in Deli is very like the European species and is of a uniform black colour, though, whenever it is found in the open, it is covered with particles of earth and other material which render it exceedingly difficult to recognise. Dr. de Bussy describes another species, not yet determined, which seems likely also to become a pest in tobacco plantations, and both species are known by the natives as "oelar kawat." They appear to prefer a light rather than a heavy soil and are found on the hill estates over the whole east coast from Slantarsche to Boven-Langkat up to 300 metres above sea level. The beetles can be seen in the middle of the day running about on the surface of the soil in the burning sun, but they are also to be found hiding under flat stones, boards, branches of trees and the like, and they are easily collected by women and children. Their first attack on the tobacco takes place in the early part of the season and generally begins in January. In February and March they are more numerous and in April they are already beginning to disappear. It is possible that the Deli *Opatrum* may require a long period for its development and that the intervals between the outbreaks may thus be accounted for. The damage done is chiefly to young tobacco plants in the first fortnight after they have been planted out and the plants are attacked just at the point where the stem leaves the earth. The larvae make smaller incisions than the beetles, only below ground; occasionally they climb up the stem and damage it. When this is observed the plant should be pulled up, for though it may not appear at the moment to be suffering there is always a danger that it will ultimately succumb to fungus or bacterial infection through the holes made by the beetles.

As a remedy, smearing the young plants by hand with earth containing 10 per cent. of naphthaline has been found useful. The spreading of building lime over the ground has also been found to give good results. The insect is very difficult to poison, and baits poisoned with arsenic and strewn between the rows of

plants have been found to have no effect. The author says that he has as yet had no opportunity of observing the effect of dipping the young plants in a 2 per cent. emulsion of lead arsenate in water at the moment of planting them out, but he thinks that this method might prove serviceable. The method of hand-collection appears to be fairly satisfactory.

Johnson (Fred.) & Hammar (A. G.). **The Grape-Berry Moth.**—*U.S. Dept. Agric., Bureau of Entom.*, Bull. no. 116, pt. 2, 13th Dec. 1912, pp. 71, 22 figs. and 5 pls.

The Grape-berry Moth, *Polychrosis viteana*, Clem., has been known as a pest ever since 1868 in the vineyards of the Lake Erie Valley and was first described by Clemens in 1860. The authors give a résumé of the history of *P. viteana* in the U.S.A. and the evidence that it is a distinct species from *P. botrana*. It is a serious pest of the grape throughout the vineyard areas of the eastern United States. The larvae attack the blossoms and very young berries, occasionally burrowing into the stems and destroying a part of the cluster. The berries are connected by silky tunnels through which the larvae pass from one to another, and when they have attained full growth they abandon these webs and travel to the leaves, on which they pupate. The moths of the first brood deposit their eggs on the now nearly full-grown berries. The larvae of the second brood are usually much more numerous than those of the first and feed upon the pulp of the fruit and sometimes on the seeds before they commence to harden, though a single larva of the first brood may destroy almost an entire cluster by attacking the stem about the time when the grapes are in bloom. As a rule the larvae of the first brood rarely destroy more than 2 or 3 berries, and those of the second brood are much more destructive.

Laboratory observations were made upon 1,000 cocoons collected in the middle of May and from these 507 moths emerged by the end of July; the bulk of them in the last weeks of June. The moth appears not to lay eggs readily in confinement, but the average period between emergence and oviposition was found to be 6½ days and the oviposition continued for about a week. The length of life of the moth averaged about 13 days. The average period of incubation was 6 days; the feeding period about 23 days, though the range was great; and the pupal period 13 to 15 days, with a maximum of 23. The second brood eggs were laid in the last week of August; the period of incubation averaged 10 days, and the feeding period 40 to 52 days. The larvae leave the fruit between the 22nd September and the 14th November, and the author remarks that as the heavy shipment of Concord grapes does not take place until the 1st October, fruit in infested vineyard areas would have to be shipped during the first week of the picking season in order that any large number of the larvae should be removed from the vineyard with the crop.

Slingerland has reared six different parasites of *Polychrosis viteana*, viz., *Bracon scrutator*, Say, *Bathymetis* sp. near *terminalis*, Ashm., *Glypta animosa*, Cress., *Glypta vulgaris*, Cress.,

Urogaster (= *Apanteles*) *canatsiae*, Ashm., *Thymaris slingerlandana*, Ashm. The following additional parasites were reared at the experiment station at North East, Pa., between the years 1906-11. *Microbracon mellitor*, Say, *Microbracon dorsator*, Say, *Apanteles* sp., *Ascogaster carpocapsae*, Vier., *Meteorus* sp., *Phytodictus* sp., *Epiurus indagator* var. *nigrifrons*, Vier., *Orthizema* sp., *Omorgus nolae*, Ashm., *Dioctes obliteratus*, Cress., *Ameloctonus* sp. and *Itoplectis conquisitor*, Say, of which the most numerous were *Microbracon mellitor* and *Dioctes obliteratus*. In addition to the above in 1906 a large number of eggs of the Grape-berry Moth in a badly infested vineyard at North East, Pa., were found to be parasitised by *Trichogramma pretiosa*, Riley. This is the first and only record of parasitised eggs of this insect which has come to the author's notice.

The infestation of vineyards by this pest is by no means general and is frequently confined to one or two rows or to irregular patches. These infested areas generally adjoin hedgerows, fences or rough lands on which leaves and trash accumulate. On the the other hand the worst infestation over the large area observed was in a vineyard remarkable for clean culture and excellent care. Adjacent vineyards are often comparatively free from infestation. This irregularity of attack causes the vineyard owners to neglect the insect or even to overlook it until picking time, and as a result, no combined operations for its eradication are undertaken. There is a certain area in the township of North East, Pa., in which the vineyards are heavily infested, though the same irregularity is observable, nevertheless the insect appears to be always present in sufficient numbers to become a menace at any time that natural conditions favour its rapid increase, and the author says that at the present time it is responsible for a greater reduction in crop yield than most vineyard owners are aware.

The following remedial measures are recommended:—The destruction of fallen leaves; ploughing the vineyard in late autumn or early spring; enclosing the grape clusters in bags; the removal of infested berries during the harvest season and the use of poison sprays. It is only within recent years that it has been known that practically all the overwintering larvae, instead of forming their cocoons upon the grape leaves attached to the vines, fall to the ground and make them on the relatively small percentage of prematurely fallen leaves. Some of these become plastered to the ground as a result of heavy rains and become quite rotten, so that their thorough removal together with the attached cocoons is a matter requiring some care, and ploughing, if properly done, is perhaps a simpler method than hand-picking; but loose leaves when dry are turned aside by the plough and not buried, so that the method is not always as effective as might be hoped. Enclosing the grape clusters in bags, which is done in some parts of New York State, primarily as a protection against rot, is expensive, and though effective can only be used for choice table varieties. Hand-picking the infested berries in July and early August reduces the numbers of the second brood. Infested green berries are conspicuous by the presence of a purple spot at the point of entrance of the larvae. These berries when

collected should either be thrown into boiling water or buried several inches deep. In late years it has become a common practice to pick and pack the fruit in baskets in the vineyard, all damaged berries being removed at the time of picking. The "trimmings" are frequently thrown on to the ground; they should be carefully collected and properly destroyed.

The author gives the results of a very large number of experiments with different poison sprays and different methods of application, and he says that the net result in the vineyards experimented upon was a great reduction in the quantity of damaged grapes and the infestation was very much less at the end of the third season of experiment than at the commencement. The irregularity of infestation, which has been referred to above, prevents any accurate determination of the real effect of the spraying, because in one part of the vineyard, the infested part, the action is direct and in the uninfested part prophylactic. The author says that in the present state of knowledge of the habits of the pest it is impossible to recommend any one method of control which would give thoroughly satisfactory results. Spraying frequently meets with only partial success and in some cases it apparently fails entirely, possibly in these cases owing to inefficient application. He strongly recommends that spraying should be systematically tried for several consecutive seasons. The article concludes with a lengthy bibliography.

Tothill (J. D.). **Tachinidae and some Canadian Hosts.**—*Canadian Entomologist*, xlv, no. 3, March 1913, pp. 69-75.

The author has examined the breeding records of the Tachinid flies in the collection of the Division of Entomology at Ottawa and finds amongst them 39 which, so far as he is aware, are new. These are set out with their hosts and comprise:—*Blepharipeza*, 1 species; *Exorista*, 8 species; *Frontina*, 2 species; *Gonia*, 1 species; *Linnaemyia*, 1 species; *Masicera*, 3 species; *Phorichaeta*, 1 species; *Phorocera*, 2 species; *Plagia*, 1 species; *Sturmia*, 4 species, *Tachina*, 2 species, *Winthemia*, 2 species.

Girault (A. A.). **Insects Injurious to Stored Grains and their Ground Products.**—*Twenty-seventh Report of the State Entomologist of the State of Illinois*, 1912, pp. 56-82, 12 figs.

The author says that over fifty species of insects live habitually or occasionally in stored cereals and cereal products in the U.S.A., but that only about ten of them are of the first importance. Seventeen are habitual grain-eaters, the remainder being more or less miscellaneous feeders. He describes and gives the life-history of the following:—

Sitotroga cerealella, Ol. (Angoumois Grain-moth).
Ephestia kuehniella, Zell. (Mediterranean Flour-moth).
Plodia interpunctella, Hübn. (Indian Meal-moth).
Pyralis farinalis, L. (Meal Snout-moth).
Tribolium confusum, Duv. (Confused Flour-beetle).

Silvanus surinamensis, L. (Saw-toothed Grain-beetle).
Calandra granaria, L. (Granary Weevil).
Calandra oryzae, L. (Rice Weevil).
Tenebrio molitor, L. (Yellow Meal-worm).

Measures of prevention.—Granary insects, says the author, are much more easily kept out than put out. All store-places for grain or its products should be entirely free from cracks and crevices, and everything, not merely apparently but really, clean. Grain should be brought in from the field as quickly as possible and if found to be infested should be treated at once. He especially advises (1) that small grain should be threshed and stored as soon after ripening as possible, and if wheat has to be stacked that it should not be allowed to stand in the field longer than is absolutely necessary. (2) The granary should be thoroughly cleaned and fumigated with sulphur, if the presence of insect pests be suspected, some time before use and the rooms should be so built as to be practically gas-tight, with arrangements for thorough ventilation under control. (3) The desirability of artificial drying of grain at 125° F. for 4 or 5 hours is pointed out as effectively killing all insects. Seed-grain should always be artificially dried, as it keeps better and germinates more regularly. (4) Farmers, seedsmen and millers are urged when buying grain to see that it is free from insects.

Treatment of infected grain.—Mere cooling of the warehouse by opening the windows in winter will often prove very effective. If the insect attack be serious, then fumigation with carbon bisulphide or hydrocyanic acid should be employed. Detailed instructions are given for carrying out the operation with the latter. The exposure, if the place be really air-tight, should be for at least 18 hours and the gas required can be generated from 1 oz. of 98 per cent. cyanide in 1 oz. of commercial sulphuric acid (sp. gr. 1·83, 66° Beaumé) for every 100 cubic feet. Generally two thorough fumigations, 3 or 4 weeks apart, will be necessary to ensure complete success. Fumigation with carbon bisulphide may be used for grain in bulk, or for flour, without detriment to either, the liquid being applied with a spray apparatus to the walls and ceilings or by setting it in shallow pans hung near the ceilings. As the result of his own experiments, the author says that 10 lb. of bisulphide are required for every 1,000 cubic feet to be treated when the granary is properly constructed to hold the vapour. Very few granaries are so constructed and careful preparation for fumigation is therefore necessary. He gives an outline of the best method of construction and says that no one room should have a capacity of more than 15,000 cubic feet. Benzine and gasoline are recommended as contact insecticides.

Use of cold and heat.—Sudden and extreme changes of temperature are peculiarly fatal to insects, *e.g.*, a reduction from 50° to zero or a rise from 60° to 100° will generally kill every insect in an infested mill or storage room. In Northern Illinois steam heat is applied by radiators and a temperature of 125° to 130° F. maintained for several hours; few insects can survive this treatment. The article concludes with a key for the identification of granary insects.

Forbes (S. A.). **What is the matter with the Elms in Illinois?**—*Twenty-seventh Report of the State Entomologist of the State of Illinois,* 1912, pp. 1-20, 4 figs., 6 pl.

The American white elm, the favourite shade tree in the towns of Illinois, is found to be subject to a fatal disease which is now prevalent throughout the State. The dry condition of the roots and the presence of borers in the trunk and larger branches seemed to point to the latter as the probable cause. *Saperda tridentata,* Oliv. (the elm tree borer), and *Magdalis armicollis,* Say. (the elm weevil), are the species generally found, the latter chiefly affecting dying trees. The evidence that the borers are the cause of the death of the trees is by no means conclusive, and the author inclines to the view that the insect attack is secondary and that the real cause is neglect of the trees, which in the streets of towns are neither fed, watered, nor protected in any way and are often so trimmed as to invite the attack of insects; topping or pollarding, in the case of elms especially, should, he says, never be practised.

Urich (F. W.). **Rearing of the Vermilion Froghopper Egg Parasite.**—*Board of Agric. Trinidad and Tobago,* Circular no. 7, 1st March 1913, pp. 1-7.

The author describes the methods employed in rearing these Chalcidid parasites for the benefit of sugar-planters, and says that they are fairly easy and that any planter might carry them out in his house or office. They are based upon those in use at the Gipsy Moth Laboratory at Melrose Highlands, Massachusetts. In order to obtain the parasites in any quantity it is necessary to collect grass or cane trash from localities in which they are known to occur and to examine first whether there is any spittle among the roots; it need not be in large quantity; one or two adult froghoppers among the grass is also a good indication. The tufts of grass are taken up with the roots, but not with too much earth, and all rotten or dry stalks should be carefully selected, as it is in this part of the plant that the froghopper lays its eggs by preference. The author describes the breeding boxes and says that as the grass is collected in the field it should be placed in the boxes in fairly loose layers and should not be packed too tightly, as this prevents the parasites from coming to the top. The grass should be left in the boxes for at least six weeks and there is no necessity to moisten it. As soon as the parasites are hatched they at once make for the light and enter the tubes from which they should be removed as soon as possible. They should then be allowed to run into small glass tubes about $\frac{3}{8}$ of an inch in diameter and $1\frac{3}{4}$ inches long, in which a piece of dry trash containing froghopper eggs has been placed. They should be fed every morning with a small drop of thin sugar and water; as much as the point of a fine insect pin will take up. In order to obtain froghopper eggs for the parasite, froghoppers should be confined in fairly large lamp chimneys, the ends of which are tied over with a piece of muslin or cheese-cloth. They should be provided with fresh green para grass every morning and a few dead para

grass leaf sheaths which are almost rotten should be placed in each lamp glass, for it is on these that the eggs will be laid. The lamp chimneys should be kept in a dark and shaded place.

The trash containing the froghopper eggs which have been parasitised should be kept moist as soon as the parasites are all dead, and the moisture may be allowed to condense on the interior of the tubes. But when the time approaches for the emergence of the Chalcidids such moisture must be carefully removed, otherwise the parasites, which are very small and delicate, get drowned; as soon as a parasite hatches it should be removed into a clean dry tube with fresh froghopper eggs. When possible, as many as 6 may be put into one tube. The whole period of development occupies from 19 to 22 days.

Adult parasites should not be liberated in the cane and grass fields until a fair number has been accumulated, and they should be reared for several generations under laboratory conditions. The best time for releasing them is about a month after the beginning of the rainy season, as there is then every probability of freshly laid eggs being present in the fields.

The author concludes with a warning to planters that the mere collection of grass and the distribution of it in the fields will not disperse parasites. No doubt parasites will issue from the grass, but so also will hyper-parasites, and in breeding the parasites care must be taken that all of these hyper-parasites are killed.

Essig (E. O.). **Injurious and Beneficial Insects of California.**—*The Monthly Bulletin, State Commission of Horticulture, Sacramento, California,* ii, nos. 1 & 2, Jan. & Feb. 1913, 367 pp., 321 figs.

The authors says that this bulletin has been issued to meet the continued demands for a full account of the economic insects of California. Thirty-one pages are devoted to a catalogue of host-plants and the insects which infest them. A brief description is given of certain Arachnida which are injurious to plants, and an outline of the various orders of insects, followed by an account of the general appearance, life-history, distribution and food-plants of each injurious species. Natural enemies, where such are known to exist, are given, and the means of control, including insecticides and methods of cultivation, together with mechanical appliances, wherever these latter may be required, are described. Several pages are devoted to methods of collection, mounting and preservation of insects, and a quantity of useful formulae for sprays and other insecticides is given. The various methods of fumigation and the apparatus required for carrying it out are discussed, the cyanide process being dealt with in considerable detail, and the book concludes with a reprint of the various quarantine orders issued by the State of California. The volume is profusely illustrated, there being no less than 282 illustrations from photographs of injurious or useful insects and figures showing the nature of the damage done by them. There is also a table showing the cost of the various articles required for fumigating operations and the approximate cost of various chemical and other products for spraying.

Jones (C. R.). **A New Coconut Pest, *Promecotheca cumingii*, Baly.**—*Philippine Agric. Review*, vi, no. 2, Feb. 1913, pp. 105-6.

A new insect belonging to the family Hispidae has been recorded as attacking coconut-palms. The injury caused by this beetle is not restricted to the larval stage, as the adult feeds upon the leaflets, slitting them longitudinally. The larva is a true leaf-miner, even the pupa stage being passed within the tissue of the leaf. The eggs are deposited singly on the underside of the leaflets and generally on the lower leaves of the young palms, the female having previously eaten a small hole through the tough epidermis, so that the young grub can enter the parenchyma immediately upon hatching. The injury caused by the larvae is greater than that caused by the adults; the combined attacks of both give the infested palm an unhealthy or blighted appearance. As yet the ravages of this beetle are more or less local, but it has been found from the Cagayan Valley in Northern Luzon to the Visayas in the south.

The author says that over 50 per cent. of the eggs, larvae and pupae are parasitised by a Hymenopteron, and were it not for this, this leaf-miner would become rather a serious coconut pest. It is probable that it can be easily controlled by collecting and destroying the infested leaflets.

Cleare (L. D.). **The Flour Moth and its Control.**—*Jl. Board of Agric., Br. Guiana*, vi, no. 3, Jan. 1913, pp. 130-137.

The author, in consequence of reports received, visited the warehouses of several large flour-importers in Georgetown and found many of them more or less infested by this pest, which appeared to be especially partial to oats. The exact species to which the Georgetown Flour Moth belongs is still a matter of doubt. The adult seems to be near, but not identical with, the Mediterranean Flour Moth (*Ephestia kuehniella*), but the pupa resembles closely that of the Indian Meal Moth (*Plodia interpunctella*). The author gives a brief résumé of the history and distribution of this pest and careful details as to the method of clearing granaries and warehouses from it by the use of hydrocyanic gas. He recommends, in addition to the ordinary methods for applying cyanide, the "stringing" of the building, that is to say, that the bags containing the cyanide should be fastened to string passed through eyes overhead and the ends carried outside and fastened, so that at the proper moment the bag containing the cyanide can be lowered into the pot containing the sulphuric acid from the outside without any risk of danger to the operator. Ten ounces per 1,000 cubic feet of space is, he says, sufficient, if the building be fairly air-tight, and the fumigation should be repeated after 3 or 4 weeks if moths are still found in the building, which should not be opened for 24 to 36 hours after the operation is completed. With regard to fumigation with carbon bisulphide, he says that as the mixture of the vapour with air is highly inflammable and explosive, most insurance companies object to its use. The

control of the pest by fumigation in Georgetown is not very practicable on account of the mode of construction of the granaries; hence the most effective method would be by means of its natural enemies, *Amorphota ephestia*, Cam., and *Bracon* (*Hadrobracon*) *hebetor*, Say, which he suggests should be imported from New South Wales, where they appear to keep the pest under control to a very large extent.

Marshall (Guy A. K.). **On New Species of Indian Curculionidae. Pt. 1.**—*Ann. Mag. Nat. Hist.* (8) xi, Feb. 1913, pp. 224-231.

The following species of economic importance are described:—*Hypera medicaginis*, sp. n., from Pusa, Bengal. Mr. Lefroy records this species as doing considerable damage to lucerne (*Medicago sativa*): *H. variabilis*, Hbst., has also been sent from the same locality.

Apoderus sissu, sp. n., from Pusa and Dehra Dun. Both Mr. Lefroy and Mr. Stebbing record this species as damaging sissu-trees (*Dahlbergia sissoo*), which it defoliates.

Harrison (J. W. H.). **Friends and foes of the Coniferae.**—*The Entomologist*, xlvi, no. 597, 1913, pp. 50-54, and no. 598, pp. 96-98.

The author desires to draw attention to a factor in economic entomology which has, in his opinion, been neglected and which is nevertheless of very great importance—that is, the value of the various Arachnids and Phalangids in holding in check insect enemies too small or too well protected to be dealt with by ordinary methods. Four woods were selected in various parts of the country for observation: the first, a mixed pine and larch wood; the second, larch, alder, pine and spruce; and the other two, spruce, larch and pine. The first wood was greatly infested seven years ago by the larch saw-fly (*Nematus* (*Lygaeonematus*) *erichsonii*) and the pines by the pine saw-fly (*Lophyrus pini*), but at the present time, although not completely exterminated, they have been practically destroyed by the ichneumon, *Mesoleius aulicus*, greatly assisted by a fungus. The saw-flies were aided in the work of destruction by the following lepidopterous larvae which were present in large quantities:—*Coleophora laricella*, *Phigalia pedaria*, *Gonodontis bidentata*, *Hybernia marginaria* and *Oporabia autumnata*. All of these, with the exception of *Hybernia marginaria*, were of sufficient importance to need special attention, but a succession of wet seasons had thinned out all except the *Coleophora* and *Phigalia*, both of which, especially the former, do an enormous amount of damage. The hibernated larvae of *Coleophora laricella* burrow into the young needles and injure them to such an extent that thousands of trees early in June looked as if blighted by frost. The pines too suffered from the

attacks of *Panolis piniperda*, the larvae of which could be beaten out in hundreds. This has also disappeared. In the same wood, as also in the second, *Lachnus pinicola* is very abundant, but kept under control by ladybirds, the principal of which are *Coccinella ocellata*, *Mysia oblongoguttata*, and *Adalia obliterata*. In spite of the work done by these parasites the larches in both woods are being killed off slowly but surely. In the first *C. laricella* is the cause, and in the second the woolly larch louse (*Chermes laricis*). These are not only destructive in themselves, but so weaken trees that they cannot resist the attacks of the larch fungus, *Peziza willkommii*, the spores of which enter at the points of injury. Affected trees seem to be at last attacked by *Sirex noctilio*, the large grub of which soon causes their final collapse.

The author thinks that neither *Sirex gigas* nor *S. noctilio* ever attacks sound trees. He has twice seen the latter ovipositing, and in each case the tree was dying. He strongly recommends that all nursery stocks of both spruce and larch should be sprayed in April and May either with petroleum and flour emulsion or lime-sulphur wash (the latter requires care in use), as he thinks that the pests are largely conveyed from the nurseries to the plantations. In beating these woods for beetles the author was greatly struck by the presence, in extraordinary numbers, of certain spiders, amongst them *Bolyphantes alticeps* and *luteolus*, and a supposed rare species, *B. expunctus*. This latter spins no webs, but lives on the twigs of conifers, devouring aphids, and probably also other insects. The author suggests that if this spider were transferred in quantity to woods of conifers in which it is not at present found, a great number of spruce and larch trees could be saved. It is exceedingly abundant in mixed spruce, larch and juniper woods in the north of Scotland, and in his opinion it would enormously assist the work of the Syrphids and Coccinellids in their attack on *Chermes*. As regards other spiders, which might possibly do effective work during the summer, he lays down the following conditions:—(1) They must be easily obtained; (2) they must be active and adult when *Coleophora laricella* is in the adult stage; (3) they should form an unbroken sequence to cope with other pests during the season; (4) they should be of arboreal habits.

He gives (p. 97) a list of such spiders with their habits, habitat, and the time of year at which they become adult. Many could be collected, he says, in large numbers from furze bushes and various shrubs by any intelligent woodman and liberated in woods infested by *C. laricella* to a dangerous extent. In order to discourage the spiders from spinning their snares too close to the ground, the wood should be kept clear of rubbish of all kinds, and this would destroy the breeding ground of a number of Scolytid beetles. It would further be well to limit the growth of heather for the same reason. The author was informed that in one of these woods the larvae of the Brindled Beauty Moth, *Phigalia pedaria*, was at one time present in sufficient numbers to affect the foliage of the larch, but it is hardly likely to become such a pest as *C. laricella*, for it emerges at a time when insect food is scarce and owls feed upon it greedily, its numbers being only kept up by the immense quantity of eggs laid by the wingless female.

Von Sengerken (H.). **Beitrag zur Lebensgewohnheit von *Otiorhynchus rotundatus*, Siebold.** [On the habits of *Otiorhynchus rotundatus*, Siebold.]—*Zeit. Wiss. Insektenbiol.*, ix, pt. 1, 15th Jan. 1913, pp. 7-12, 1 fig.

The author has found that nearly all the branches and twigs of *Syringa vulgaris* are attacked by this insect in the neighbourhood of Danzig. The beetles are nocturnal and exceedingly shy of light, and drop to the ground at the slightest sound, so that much care is required in order to capture them. They make their appearance in June and begin their work on the leaves of the Syringas at once. They are greatly affected by temperature, very few being seen on cold nights. During the day they conceal themselves, but on very dark or cloudy days they will feed even in daylight, although slowly. The eggs appear to be laid on the roots of the host plant very slightly below the surface and the author found hibernating specimens of both sexes in the soil in January.

Destruction des Insectes par les rayons ultra-violets. [Destruction of Insects by the ultra-violet rays.]—*Journal d'Agric.-trop.*, 31st Jan. 1913.

It has been discovered by Mr. E. A. von Neustadt that the bluish light produced by incandescent lamps containing vapour of mercury, which is particularly rich in violet and ultra-violet rays, is peculiarly attractive to moths, and he has constructed an apparatus in which a lamp is placed in the centre of a circle occupied by a helix, which is made to turn rapidly by a small electric motor, thus producing a violent current of air. This current of air draws the insects that have been attracted by the light into a gauze cage, which, after the operation is complete, can be removed and immersed in tetrachloride of carbon. The whole apparatus is carried on a waggon, including the motor and dynamo. Experiments have been made with the apparatus in East Africa, near the cotton fields, and specimens of nearly every parasite of cotton were rapidly obtained. The cost of the apparatus is somewhat against its employment, but possibly, in the case of serious attack threatening the whole harvest, this, or some modification of it, might be of great service.

The Destruction of *Albizzia* in Cairo.—*Kew Bull. of Miscellaneous Information*, 1913, no. 2, pp. 94-95.

Mr. St. C. Feilder, chief gardener to the city of Cairo, states that until the summer of 1909 the city contained some thousands of "lebbek" trees, which formed shady avenues throughout the place. In the space of four years, three-quarters of these trees have disappeared, their destruction being due to the ravages of a species of mealy bug, *Dactylopius perniciosus*, which is capable of destroying the largest tree entirely in four months. Although it is only of recent years that this mealy bug has made its presence felt, it has doubtless existed in Egypt, unnoticed, for a number

of years. The insects can be found on almost every "lebbek" in the neighbourhood of Cairo, but it is only in the town that it has caused serious damage; for on the other side of the Nile, where the paths are not paved and the roads not tarred and where the trees are well exposed to the weather, the mealy bug, though present everywhere, has made no headway, and it seems therefore that the increase of the insect is determined by the state of health of the host. The attack begins in May, reaches the maximum in June and July, and begins to slacken in August.

Mr. F. C. Willcocks, Entomologist to the Khedivial Society of Agriculture has already published a full account of this pest (*Bull. Ent. Research*, i, 1910, pp. 121-137).

WARNER (H.). **The Cacao Beetle.**—*Proc. Agric. Soc., Trinidad*, Feb. 1913, pp. 89-91.

Besides the actual loss sustained in many plantations, the extension of cacao cultivation is greatly hampered in certain districts by the attack of this beetle (*Steirastoma depressum*, L.) on young trees, and there are districts in which, despite other difficulties, cacao could be grown, but the beetle destroys the trees to such an extent that attempts at cultivation are useless. In the six months to December 31st last, 32,627 beetles were destroyed on two estates and about as many in the previous six months, this work regularly employing the services of a small gang of men, and in no single month did they fail to catch large numbers.

The author urges that it is almost useless for one planter to expend money and labour upon getting his plantation clean if a neighbouring one is neglected. He complains particularly of wild chataigne trees being left rotting on the ground, as greatly assisting the breeding of the beetle. He cites an example of a piece of this wood which was overlooked on his plantation and which was only 12 ft. long and 6 ins. in diameter. This was found to contain 400 grubs and 20 cacao beetles in the pupa stage. He expressed the hope that every possible means would be taken, by means of drawings and lantern slides, and especially the plates from Mr. Guppy's pamphlet, to be used in schools all over the island, for the purpose of instructing the people generally as to the beetle and its habits, which, he says, are by no means sufficiently known outside the cacao plantations.

VAN HALL (Dr. C. J.). **Robusta and some allied Coffee Species [in Java].**—*Agric. Bull., Federated Malay States*, i, no. 7, 1913, pp. 251-259.

The author says that the "bubuk" (*Xyleborus compactus*) is sometimes the cause of the loss of many branches, but it has always been observed that after a serious attack the insect disappears without special measures having been taken. It is apparently kept in check by its natural enemies, of which a small Chalcidid seems to be the most important. In some places the cultivation of *Coffea robusta* is rendered almost impossible by the attack of an

Anguillulid (*Tylenchus acutocaudatus*). Happily this enemy is not very common, and is confined to special regions. In late years the caterpillar of a Microlepidopteron of the family of Tineidae has done much damage to the blossoms and the clusters of young fruit, especially in the dry season, during the months of June, July, and August.

Ballard (E.). **The Cotton Aphis.**—*Dept. of Agric., Nyasaland Protectorate*, Circular no. 1, 1913.

In Nyasaland continued rains and clouded skies are extremely favourable to the increase of the cotton aphis, although it is naturally controlled to a certain extent by ladybirds (Coccinellidae). The only way to check the pest is by spraying with a contact poison as soon as the first colonies appear. The cotton crop should be constantly watched and measures taken at the first sign of attack, for if the winged forms are not kept down the cost will be enormously increased. Kerosene emulsion and tobacco infusion are found to be the best spraying materials in Nyasaland. The former has the drawback of expense, but the latter, though cheap, is not nearly so strong an insecticide as the kerosene. It has, however, been tried with success at the Bwaila Experimental Gardens. The "Four Oaks" knapsack spraying machine is recommended as the best apparatus; all the working parts are outside, and it is made of copper, so that it is not damaged by insecticides. With one machine two men should be able to spray four acres in a day, where only plants here and there have to be treated. Instructions should be given to the men to spray the underside and not the upperside of the leaves and stalks.

Noel (Paul). **Les ennemis des Lentilles.** [The enemies of Lentils.] —*Bull. Lab. Régional d'Entomologie Agricole, Rouen*, 1913, pt. 2, pp. 11 & 12.

The author points out that lentils might with advantage be much more largely cultivated as they are a good winter vegetable and make excellent forage for cows. He gives the following list of insect enemies of the plant:—

Coleoptera.—*Apion ervi*, Gyll., *A. viciae*, Pk., *A. vorax*, Hbst., *A. craccae*, Hbst., *Bruchus granarius*, L., *B. lentis*, Boh., *B. pallidicornis*, Sch.

Hemiptera.—*Aphis pisi*, Kalt.

Diptera.—Cecidomyid, No. 4110, Darboux and Howard, *Asphondylia ervi*, Rübs., *Perrisia viciae*, Kieff.

Acari.—*Eriophyes plicator trifolii*, Nal.

Noel (Paul). **Les ennemis des Melons.** [The enemies of Melons.] —*Bull. Lab. Régional d'Entomologie Agricole, Rouen*, 1913, pt. 2, p. 13.

The author complains that most of the melons put on the market have neither taste nor perfume, probably owing to the cost of

more careful cultivation, and the fruit is, he says, considerably damaged by *Aphis papaveris*, F., and by an Acarid, *Acarus telarius*, L., and also by certain Nematodes *Heterodera radicicola*, Greff, and by five species of fungi.

Vuillet (A.). **Description d'une nouvelle espèce et d'un nouveau genre de la famille des Phloeothripidae.** [Description of a new species and a new genus of the family Phloeothripidae.] —*Insecta*, no. 27, March 1913, pp. 77-84, 12 figs.

The author describes at length a new species discovered in the neighbourhood of Marseilles by M. H. J. Cotte in the deformed calices of *Dianthus caryophyllus*, L. A figure is given showing the unopened flowers of the carnation destroyed by this insect.

Forbes (S. A.). **Corn Root-aphis in Illinois.**—*Circ. Agric. Expt. Sta., Univ. Illinois*, 7 pp., n.d.

This aphis infests a great variety of plants, but corn, sorghum and broom-corn are the only crops on which it is found in Illinois for any length of time. It was once found by the author on the roots of wheat, growing on old corn ground, but corn is the only Illinois crop which it materially injures. It is quite at home on many wild plants and on several weeds which grow on cultivated land, especially smartweed (*Polygonum*), ragweed (*Ambrosia*), foxtail or pigeon-grass (*Setaria*), and crab-grass (*Panicum*). On these it thrives best in the early spring, but as they get dry in summer it prefers a rapidly growing succulent plant like maize.

Eggs are laid in the autumn and hatch in March or April, the young aphids being placed by ants on the roots of young field weeds; here they give birth to a second generation in 12-15 days, and these to a third in about as many days more. The time required for a generation to reach maturity shortens as the season advances, and in July and August may be as little as 6-8 days. The eggs hatched in spring yield only wingless forms, and, under the best possible conditions for the species, many successive generations may consist of wingless insects only; but if the plants become over-stocked by them, or if the weather becomes dry and the flow of sap diminishes, a variable percentage of each generation after the first may acquire wings and fly away. Wherever they happen to fall they are taken possession of by ants and placed as promptly as possible on the roots of plants capable of maintaining them. Up to this period all the aphids are viviparous females, but as the weather cools, the last generation of the season contains both sexes, and it is the fertilised females of this generation which lay the eggs by which the species is carried through the winter. Careful experiments have shown that there is in Illinois a minimum of 11 and a maximum of 22, or an average of about 16 generations in the year. The number of young produced varies very greatly according to the food the female obtains, varying from 20 to 98, with an average of 44.

The best time for attack on the root aphids would appear to be the spring, and, as they begin to hatch some time before any crop is on the ground in a condition to furnish food to the young, there is a period of from 2-4 weeks when they must get their support wholly from the young field weeds, which start from the seed in March or April, at just about the time when the winter eggs are beginning to hatch. Later the ants transfer the insects to the sprouting corn, so that the control of the weeds is a matter of some importance.

The ant requires almost as much attention as the aphis, because were it not for the care taken by the ants to protect and cultivate the aphis their numbers would be enormously reduced by natural means. The best method of attacking the ants appears to be ploughing to a depth of 6 to 7 inches, and then repeatedly going over the ground with a disk plough to the same depth, and after the last disking the soil should be packed with a heavy roller. The time for these operations would very largely depend on the weather; most of it would be done in the early spring. These operations are of the greatest importance on land in which corn is intended to follow corn. In the experience of one large farmer, if this thorough, deep preparation of the ground for corn is kept up year after year, not only the corn root aphis, but most of the other corn insects will be gradually exterminated. The value of the method is shown by the greatly increased yield.

As a result of experiments with a number of substances, the author has arrived at the conclusion that bone-meal or any other powder fertiliser treated with oil of tansy, and then dropped on or very near each hill by means of a fertiliser-dropper attached to the planter, is very effective in driving away the ants. It is, of course, not necessary that the powdered substance should be a fertiliser. The following preparation was found useful:— For each acre of land, 100 pounds of bone-meal thoroughly moistened with a quarter of a pound of oil of tansy, well mixed with one gallon of denatured alcohol or wood spirit. It must be remembered, however, that this is merely a secondary measure and will at best protect the ground only for a short time. It will not kill the ants or their young, but will keep them out of the corn hills, and if the weather should be wet it may be quickly washed away, though rain itself is one of the most fatal natural causes of the destruction of the aphis.

It is clear however, from what has been said above, that it is of great importance to kill the weeds in the early autumn before they have had time to ripen their seed, and that frequent rotation and late surface cultivation are important aids to the control of the corn root aphis.

Champion (G. C.). **An introduced West African Longicorn, *Cordylomera suturalis*, Chev.**—*Entom. Monthly Mag.*, March 1913, p. 63.

This insect has been found in a piece of so-called mahogany by a cabinet-maker at Gravesend. It is not by any means the first time that this Longicorn has reached England.

Stoner (D.). **The Harlequin Cabbage Bug in Iowa.**—*Entom. News., Philad.*, xxiv, no. 3, March 1913, pp. 132-133.

This pest, *Murgantia histrionica*, has been found near Iowa City, though no damage from these bugs has as yet been reported. The author says that although not common in Iowa it is clear that the range of the insect is being gradually extended through the Mississippi Valley.

Parrott (P. J.) & Hodgkiss (H. E.). **The False Tarnished Plant Bug on Pears.**—*New York Agric. Expt. Station*, Circular no. 21, 4 pp., 1 pl. and 6 figs.

In certain sections of western New York this insect (*Lygus invitus*, Say) is very troublesome to pear-growers. The damage done by it has attracted attention for a long time, but very little has really been known regarding the insect. Experiments conducted by this Station have shown that it is amenable to spraying. The mature insect is very similar in appearance to the common tarnished plant-bug (*Lygus pratensis*, L.) which occurs on a great many wild and cultivated plants and is well known to many farmers. The newly hatched nymph attacks first the tender leaves of the pear, which become blackish about the points of injury; if feeding is extensive, the margins of the leaf become discoloured and shrivel up, the dead parts becoming detached later. The older nymphs attack the young fruit. A single nymph may stab a small pear many times, and though the original wounds are quite insignificant, they become very prominent and cause great disfiguration as the pear increases in size. Mature pears have the epidermis ruptured in various places, and these areas are hard and flinty and can only be cut through with difficulty with a knife. Pears which have been much punctured are usually undersized and much deformed. The extent of the losses due to the work of this insect varies in different orchards, and according to season; some orchards sustain more or less injury every year, and in 1908 a well known pear-grower estimated that 75 per cent. of his crop was damaged and half of it lost. The eggs hatch during the period when the trees are coming into blossom and hatching continues until the young fruits are about the size of filberts. In recent years the young nymphs have appeared in greatest numbers about the time when the petals begin to drop. The maximum damage is done in the month of May; in the first half of June the bulk of the insects are in the 5th or last nymphal stage and the mature or winged forms generally appear about the 2nd or 3rd week of this month. The adults remain on the trees among the succulent growth and on the fruit for a short time after their emergence, and then disappear from the orchards. The best remedy appears to be spraying just after the period of blossoming, and treatment should not be delayed until injuries commence to show themselves on the young fruits. The Station authorities found that ¾ of a pint of tobacco

extract "Black Leaf 40" to 100 gals. of water to which 3 lb. of soap has been added gave the best results. The trees should be drenched and special pains taken to wet both surfaces of the leaves. Some growers have combined the nicotine extract with dilute lime-sulphur containing arsenate of lead, as applied for codling moth, with equally satisfactory results on both insects and foliage, and by this means avoided the necessity for an extra spraying. But as there is danger of burning pear foliage by drenching the trees with lime-sulphur, the authors advise a special treatment with nicotine and soap to combat this particular pest.

Parrott (P. J.) & Hodgkiss (H. E.). **The Pear Psylla.**—*New York Agric. Expt. Station*, Circular no. 20, 8 pp., 7 figs., 2 pls.

The pear psylla is one of the principal enemies of pear orchards, and in some parts of New York State is perhaps the most destructive insect pest of this fruit. The injury done at the end of May or early in June is usually attended with more serious consequences than that occurring later, the growth of the trees being severely checked. The leaves become stunted and discoloured, owing to the extraction of the plant-juice or of sun-scalding from the collection of honeydew on the leaves. If the attack is of long duration the leaves drop, and in some seasons the trees are completely defoliated.

In western New York the eggs are usually to be found about the first week in April, that is about a week after the flies emerge from their winter quarters, and in some seasons are so abundant as to cause the bark to have a yellowish appearance in spots. When the insect has accomplished its 5th moult it is a flat oval creature of a brownish colour, with whitish or greenish mottling, and with conspicuous dark brown wing-pads; these are known to most pear-growers as "hard shells." The adults live through the winter hidden in crevices under the loose bark of the trunks and larger branches, or under fallen leaves, &c., on the ground. Oviposition is greatly interfered with by bad weather and it may, in consequence, be very prolonged. The largest number of nymphs is generally found on the trees about the time that the blossoms drop, and they usually attach themselves to the axils of the leaves and at the bases of the fruit stems. Two or three days after hatching the nymphs cover themselves with honeydew. Successive generations of nymphs occur during the summer at intervals of approximately one month. The period of incubation of eggs of the summer broods is shorter than that of those deposited by the flies, and averages about 10 days.

The pear psylla has several insect enemies which have a considerable effect in keeping it down, ladybirds and a species of lace-winged fly being the most common and efficient. A parasite develops within the bodies of the host and destroys many of the nymphs; this parasite appears to be very widely distributed, but

the author does not give any details as to its nature or mode of operation.

The hibernated adults, the first brood of eggs and the newly hatched nymphs are the most susceptible to spraying, and it has been proved that if this be thoroughly carried out the pest may be practically destroyed. In order to be thoroughly effective the spraying should be done during warm weather, preferably in November and December or during March and early April. A rise in temperature induces the insects to emerge from their hiding quarters and creep to the portions of the trees exposed to the warm rays of the sun and protected from a cold wind. The insects are very sluggish in their movements and do not fly, and this facilitates thorough spraying. Experiments have shown that it is wise to spray one tree very thoroughly before proceeding to another. In warm weather the flies can move fast enough to get round from one side of the tree to the other, so that if a row of trees be sprayed first on one side and then on the other large numbers of the flies may escape. Care should be taken to select days for the work when there is no danger of the spraying mixture freezing on the trees. The best mixture is said to be ¾ pint of "Black Leaf 40" to 100 gals. of water to which 3 to 5 lb. of dissolved soap have been added. It is well, before spraying, to remove carefully all loose and rough bark; this has the double advantage of discouraging the flies from wintering on the trees and of facilitating the application of the spraying mixture. The eggs about to hatch and the newly-emerged nymphs succumb to an application of the lime-sulphur mixture,—lime-sulphur solution (32° to 34° B.) 1 gal., water 8 to 9 gals. Most growers spray before April for the San José scale, but by postponing the treatment of pear orchards until the blossom clusters are well advanced, one may deal another effective blow against the psylla, and with the same treatment, successfully combat the scale. The spraying should be liberal, and pains should be taken to wet all portions of the tree especially the fruit spurs and the undersides of the young wood, where most of the eggs are laid.

The first brood nymphs, which are largely assembled in the axils of the young leaves and fruits during the latter part of the blossoming period, can be satisfactorily destroyed by spraying with the tobacco mixture (*see* above) just as the blossoms drop and again in late summer; a thorough spraying will do much to save the necessity for the winter treatment. With careful work the authors say that it is not necessary to carry out all these measures each year, and some growers have entirely controlled the psylla by attacking hibernating flies only. Kerosene emulsion (kerosene 2 gals., whale or fish oil soap ½ lb., soft water 1 gal.) has been successfully used for summer spraying against the nymphs, by diluting the emulsion in the proportion of 1 gal. to 8 of water. They attribute the frequent failure among growers to protect their orchards from the psylla chiefly to the lack of a definite system of treatment, because of the belief that the pest is periodical in its attacks, which has been repeatedly shown to be a fallacy.

Dupont (P. R.). **Notes sur quelques Cochenilles (vulgairement appelées poux) qui attaquent le cocotier et autres plantes de grande culture à Mahé (Seychelles).** [Notes on certain Coccids which attack the coconut palm and other plants cultivated on a large scale at Mahé (Seychelles).]—*Bull. Soc. Belge d'Etudes Coloniales*, no. 2, Feb. 1913, pp. 164-167.

So far back as 1905 the author drew attention to the great damage caused by Coccidae in many parts of the Seychelles. The prolonged drought, which lasted for seven years and only ended in November 1911, was followed a few months after by the appearance of these insects. Fortunately their fungus parasites have appeared in great numbers at the end of the rainy season.

Seven species of *Lecanium* are mentioned as known in the Seychelles:—

Lecanium (*Saissetia*) *oleae*, on "La fouche" (*Ficus rubra*, Wakl., var. *sechellensis*, Baker).

Lecanium (*Saissetia*) *nigrum*, on *Hevea* and *Hibiscus*.

Lecanium (*Coccus*) *hesperidum*, on *Cassia*.

Lecanium (*Eucalymnatus*) *tessellatum*, on "veloutier" (*Tournefortia argentea*, Linn. fil., and *Scaevola königin*, Wakl.), coffee, coconut and cinnamon.

Lecanium frontale, on "filao" (*Casuarina equisetifolia*, Forst.).

Lecanium (*Coccus*) *viride*, on coffee, citron, lemons, oranges and "buissons ardents" (*Ixora grandiflora*, DC.).

The author says that there is no difficulty in propagating a certain fungus by which the scale-insects have been attacked during last year, and which has been identified as a species of *Hypocrella*. The simplest plan is to attach to the infested trees leaves or twigs bearing scale-insects attacked by this fungus. Another plan, which requires more care but gives much better results, is to make pure cultures of the parasite and scatter the spores on the leaves of the trees which it is desired to infect, by means of a spraying apparatus made of tin: copper must not be used, because of its rapid action upon the fungus.

Lecanium viride, which is said to have caused the disappearance of almost all the thorn-bearing trees in the Colony, is attacked by *Cephalosporium lecanii*; while another fungus, identified as a species of *Microcera*, has been found to infest *Diaspis pentagona*, which damages the leaves of plum trees and the trunks of papaws (*Carica papaya*, L.).

Another Coccid, *Aspidiotus ficus*, is said by the author at the present time to be causing very considerable damage to young coconut palms almost everywhere throughout the group, and in the west of Mahé to be also damaging adult palms. This Coccid also attacks roses and the false sago palm. The leaves as well as the fruits are infected with such rapidity that in a few months the young coconut palms may be killed, and the vigour of older trees diminished considerably for several years. As yet, no fungus parasite appears to attack this Coccid, and all that can be done is to inspect all the plantations carefully and to destroy every leaf which is found to be infested and also all fruits gathered from the

infested trees. The latter are easily recognised, because the leaves in the middle of the crown, though still young, are withered at the extremities and have a characteristic appearance.

Insect Pests in British Guiana.—*Jl. Board of Agric, Br. Guiana*, vi, no. 3, Jan. 1913, pp. 153-4.

The following are reported as having been received from correspondents:—The larvae of *Papilio anchisiades*, Esp., feeding on lime trees; larvae of *Pieris* (*Pontia*) *monuste*, L., feeding on cabbage; larvae of the hawk-month, *Xylophanes tersa*, Drury, feeding on *Pentas rosae*, and previously recorded from soursop (*Anona muricata*); grubs of the Dynastid beetles, *Ligyrus ebenus*, de G., and *Phileurus didymus*, L. (*bajulus*, Castn.), attacking sugar-cane; *Lecanium* (*Saissetia*) *nigrum*, Nietn., from rubber trees; the orange snow scale, *Chionaspis citri*, attacking *Tephrosia purpurea*.

Wilson (H. F.). **Insect pests in Oregon.**—*Report of the Dept. of Entom., Oregon Agric. Coll. Expt. Station, Corvallis, Oregon*, pp. 81-121 of Biennial Crop Pest and Horticultural Report, Jan. 1913.

The author gives a popular treatise, illustrated with five plates, on the plant lice attacking orchard and bush fruits in Oregon. An account of the Shot-hole Borer or Pear Blight Beetle, *Xyleborus dispar*, F., contains a history of the insect, and details its distribution in Europe and the United States. The author remarks that at the present time the infested territory is increasing very rapidly, and that the insect will in time undoubtedly spread over the entire western part of the State. A list of fruit and forest trees known to be attacked is given, although the author says that it is far from complete. The article contains an extensive bibliography of this insect from 1784 to 1910. The smaller Shot-hole Borer, *X. saxeseni*, Ratz., is also described; but this insect is believed only to attack dying trees.

The Codling Moth, *Laspeyresia* (*Carpocapsa*) *pomonella*, L., is next dealt with, and the author warns intending planters of orchards against the supposed existence of immune regions, saying that wherever the apple tree will grow the Codling Moth will thrive. Special directions for dealing with the pest suitable to climatic conditions in Oregon are given.

The next article is on the San José scale, *Aspidiotus perniciosus*, Comst., which is published, the author says, rather to meet the demands of cultivators than to add anything to our knowledge. He regards lime-sulphur spraying as an entirely efficient remedy.

Tent Caterpillars, *Malacosoma erosa*, Stretch, *M. pluvialis*, Dyar, *M. constricta*, Stretch. The first and second of these are said to feed upon almost everything except the pear tree. The third will devastate whole groves of oak, especially *Quercus garryana*, occasionally migrating to the prune and causing alarm

to orchard-owners. During the past two or three years *M. pluvialis* has been extremely abundant in the west of Oregon on some fruit and forest trees, the damage done in many cases being very serious. The Brewers' Blackbird, which is very common in Oregon, is very fond of the pupae and may be observed tearing open the cocoons and feeding on them. The artificial methods of control are similar to those in use against the Codling Moth.

The Cherry and Pear Slug, *Caliroa cerasi*, L., is a common pest of pear, cherry, plum and other fruit trees, and though not difficult of control causes considerable damage. Of four remedies tried against this pest, white hellebore gave by far the most satisfactory results—1 lb. to 50 gals. of water. No foliage was injured, and the larvae were nearly all dead on the day following the application. Care must be taken that the material is fresh and free from adulteration. "Black Leaf 40" gave practically the same results and did not injure the foliage, but it is more expensive than the hellebore. Arsenite of zinc and arsenate of lead did not prove satisfactory, the damage to the foliage being somewhat serious at the strength required to produce any good effect upon the larvae.

Lovett (A. L.). **Pests of Strawberries and small fruits in Oregon.**—*Report of the Dept. of Entom., Oregon Agric. Coll. Expt. Station, Corvallis, Oregon*, pp. 122-146 of Biennial Crop Pest and Horticultural Report, Jan. 1913.

Otiorhynchus ovatus, L., is described and figured, a list of the host plants both of the beetle and the larvae is given and the seasonal history discussed. As a measure of control the author proposes to take advantage of the inability of the beetles to fly and experimented with a barrier round newly-planted fields in order to keep them out. This barrier, consisting of a 12-inch board surmounted by a strip of tin, was unfortunately erected too late, and the experiment was only partially successful, but undoubtedly the number of weevils was considerably reduced. Spraying with a mixture of lead arsenate 3 lb., whale oil soap 3 lb., water 50 gals., was practised on the field inside the barrier and insects which had found their way into the field are said not to have touched the sprayed foliage. Such barriers would be of no use to orchard-owners who grow strawberries between rows of trees, nor would they be of use on land already seriously infested with the grub. The author considers the strip of tin unnecessary, and thinks a band of "tangle-foot" would be quite sufficient to keep out the beetles; the barrier should be in place by March 20th. Growers should, if possible, obtain new plants from uninfested districts only, and in any case should examine all received very carefully for adult beetles. A long list of spraying solutions is given, with a summary of the results of their application, for the most part unsatisfactory.

The natural enemies of *Otiorhynchus* have not, in the author's opinion, been sufficiently studied. He says that an immature Gamasid mite was discovered feeding on the eggs at Gresham,

Oregon. Domestic fowls feed on the larvae and pupae when allowed to follow the plough. Carabid beetles and their larvae are often found about strawberry hills, and at least two species of spider attack the adult beetles.

Other species of *Otiorhynchus* infest strawberries in the State of Oregon. *O. sulcatus* is reported as doing considerable damage, and also a larger species which is figured but not named. In the neighbourhood of Oswego, *O. rugifrons* is said to have an even greater capacity for destruction than *O. ovatus*, some growers having been compelled to give up strawberry culture entirely in consequence of its operations. The Strawberry Crown Miner, *Aristotelia* sp., is distributed over the whole State and does a considerable amount of damage, as does also the Root Borer, *Sesia rutilans*, Hy. Edw. In both cases the only remedy appears to be to dig up and destroy the infested plants.

The Currant Maggot or Gooseberry Fruit Fly, *Epochra canadensis*, Loew, is said to be possibly one of the most serious pests of these fruit trees in the State. One female may lay as many as 200 eggs, usually depositing only one egg on each fruit. The control measures suggested are the free use of insect nets in the mornings during June and allowing poultry to run through the bushes for a few hours each day to pick up the fallen fruit; this will materially lessen the next season's crop of flies. As the pest spends 11 months of the year underground, loosening the soil with a spade to the depth of 4 or 5 inches close to the bushes is useful; this will break up the pupal cells and expose the insect to unfavourable weather conditions and the attack of its enemies. Heavy mulching with straw in the spring has been suggested as preventing the flies from emerging. The use of poisoned sprays has been tried, but the results were not very conclusive, beyond the fact that the sweetened poison certainly attracted the fly. Mr. Malley has observed that in the case of the lead arsenate emulsion used as a spray, if the globules are too large the poison settles out and the flies are able to feed without obtaining any poison at all.

The Raspberry Cane Maggot, *Phorbia rubivora*, Coq., is reckoned as one of the serious Oregon insect pests, and the remedy suggested is to cut off the infested canes well below the girdle and to destroy them.

The cultivated blackberries and loganberries are occasionally injured by leafhoppers. Cleanliness in the plantations, the removal of all leaves, trash and rank grass, and spring ploughing, where practical, are useful preventive measures. Spraying, repeated twice or even three times, with whale oil soap, kerosene emulsion, resin spray (1 lb. resin and ¼ lb. lye dissolved in 15 gals. of water) and "Black Leaf 40" were found to give good results. The author suggests that possibly sticky shields, constructed of heavy wires about 5 feet in length and 4 feet wide covered with oilcloth or canvas and smeared with crude oil or resin, dragged between the rows of bushes, might yield results that would be worth the labour.

The Cabbage and Radish Maggot, *Phorbia brassicae*, Bouché, is considered to be a very serious pest throughout the State of Oregon, and it also attacks most of the allied Cruciferae.

Ploughing the infested fields as soon as the crop is removed will materially lessen the next year's brood. The soil should be turned to a depth of four inches or more and all old stumps or refuse from the previous crop should be carefully removed from the soil. In the case of seed-beds the value of screens has been clearly shown, that is, wood and wire frames with cheese-cloth (20 threads to the inch) stretched over them. If properly constructed it is said that they will entirely prevent injury by the maggot, and they also have certain other advantages in hastening the growth of the plants which more than compensate for the cost. The use of tarred felt discs, described by W. H. Goff (Circular 63 of the U.S. Bureau of Entomology), is said to be very effective and at the same time cheap.

Wilson (H. F.) & Lovett (A. L.). **Miscellaneous Insect Pests in Oregon.**—*Report of the Dept. of Entom., Oregon Agric. Coll. Expt. Station, Corvallis, Oregon,* Jan. 1913, pp. 147-165.

Lepidosaphes ulmi, L. (Oyster-shell Scale) is probably as widely distributed as the San José scale and causes great injury to fruit trees throughout the United States. In some parts of Oregon it is quite common and very abundant on unsprayed fruit trees. Its operations are supposed not to be so serious as those of the San José scale as it rarely kills entire trees, though single branches will become so weak that they will not produce fruit and may die. This pest not only attacks fruit trees but a large number of shade trees, vines and bush fruits. It has been said that lime-sulphur will not destroy the eggs of this pest, but the authors have observed that where this spray is consistently used against the San José scale the oyster-shell scale does not thrive and no extra application is needed, and they think that the insect can be held in check with this spray. In the case of shade-trees and bush fruits which are often so badly infested that spraying is necessary, kerosene emulsion applied just as the eggs are hatched in the spring seems to be the best. A high pressure spraying pump should always be used.

Lecanium corni, Bouché. The European Fruit Lecanium has only been found as a pest on prunes in Oregon, but in California it is known as the Brown Apricot Scale because of the serious damage done by it to apricot trees. Lime-sulphur is not very efficient against this insect and in case of serious attack the authors advise the use of what is known as the distillate oil emulsion spray, of which the following is the formula:—Hot water 12 gals., fish oil soap 30 lb., distillate oil (28° Baumé) 20 gals. The fish oil soap is made as follows:—Water 6 gals., lye 2 lb., fish oil 1½ gals. These boiled together for about two hours will produce 40 lb. of soap. The spray is made by taking 5½ gals. of the concentrated emulsion, adding to it 44½ gals. of water and 1 lb. of caustic soda to soften the water. The mixing should be as thorough as possible and is best effected by repeatedly driving it through a force-pump back to the reservoir or containing vessel.

Tibicen septemdecim, L. (Periodical Cicada). The adults of this insect only appear in the northern United States at intervals of 17 years and in the southern of 13 years. Many insecticides are effective against this pest, but to be of real value they must be applied each day as long as the insects issue in numbers. Coating trees with whitewash or spraying with a strong solution of lime-sulphur offer possible means of preventing egg-deposition, as it has been stated that the cicadas do not like to sit on a white surface.

Hemerocampa vetusta, Boisd. (Western Tussock Moth). This insect is at present limited to the Pacific Coast and on account of the similarity of its work to that of the Tent Caterpillar is often taken for one of those insects. The authors say that there is little danger that this insect will ever become a very serious pest, but nevertheless at times it requires special attention. Contact sprays appear to be entirely useless and the only methods that offer any chance of success are either to collect the eggs or to place sticky bands on the trees and then jar them; the larvae drop and cannot get past the bands as long as they are kept freshly painted with the sticky material.

Tischeria malifoliella, Clemens? (Trumpet Leaf Miner of Apple). This insect is perhaps not of great importance to fruit-growers in Oregon, but occasionally it appears in very large numbers, as has been the case during the past 2 or 3 years. The damage done to the leaves by the larvae causes them to fall prematurely, thus interfering with the proper development of the fruit and the health of the tree. The best method of control appears to be to plough the orchards in the spring, burying as far as possible all the fallen leaves and trash, as it is in the former that the pupae pass the winter. This should be done not later than the time at which the trees are in blossom.

Tmetocera ocellana, Schlieff. (Eye-spotted Bud Moth). The larvae of this moth resemble those of the Peach and Prune Twig Miner sufficiently closely to be taken for them, but this latter attacks only stone fruits and the former confines itself almost entirely to orchard trees. Spraying the trees with kerosene emulsion in early spring before the buds open, or spraying with arsenical mixture when the larvae are feeding, are good remedies; if done in the first week of September, this will also help to catch a great many larvae of the Codlin Moth.

Sanninoidea opalescens, Hy. Edw. (Western Peach Root Borer). This has been reported only from four or five extreme western States. This is another insect so closely resembling an Eastern species as to be distinguishable only by the absence of a definite orange-coloured band across the abdomen. The habits of this Western species do not materially differ from those of the Eastern, both attacking trees to a greater extent in light sandy or gravelly soil, and peaches are most susceptible to attack, though prunes and apricots are almost equally favoured. Almonds, cherries, apples and native plums may be attacked. The Myrobalan plum is very little affected under normal conditions, and should be used as stocks upon which to graft the domestic plum. The Eastern agricultural authorities came to the conclusion that

washes and poisonous substances with a disagreeable odour were practically useless as preventives, but the authors say that good results have been obtained both from the use of whitewash and Paris green and by spraying the bark with thick Bordeaux mixture and Paris green.

Magdalis aenescens, Lec. (Bronze Apple Tree Weevil). Like many of the common insects found in Oregon, this appears to be a native of the north-west and has only been recorded from Oregon, Washington and British Columbia. Most of the feeding occurs in the bark and many growers have reported very serious injury to their trees. Careful examination of the bark and cutting out infested areas appears to be the most satisfactory methods of combating the pest.

Rhagoletis cingulata, Loew (Cherry Fruit Fly). During the last year or two enquiries have been made for remedies against maggots which destroy cherries. The larvae of this insect probably live about three weeks, the mature stage being reached just about the time the fruit is ripe, and as they remain in the fruit for a short time after it is picked, they may be distributed over considerable areas. The adults are not strong on the wing and can hardly do more than fly from tree to tree, or at the most from orchard to orchard. Many remedies have been tried but none of them has proved satisfactory.

Syneta albida, Lec. (Fruit Tree Leaf Syneta). This insect is reported as having done considerable damage for some time past. There are practically no published accounts of its habits and life-history. The adults appear suddenly in the spring, are very abundant for a few weeks and then disappear almost as suddenly. Larvae have been found at a depth of 14 inches below the surface. The serious damage is done by adults; when the blossoms open in the spring they feed on the petals. Later in the season the leaves of apples and prunes are the principal parts eaten, and trees will often have holes in almost every leaf. Perhaps the most serious injury is done to young grafts, especially where whole orchards have been grafted over. The operations of the insect in these cases frequently kills the tree. Various remedies have been tried but none has proved satisfactory. Young grafts can be protected by the use of cheese-cloth.

Bembecia marginata, Harr. (Raspberry Root Borer or Blackberry Crown Borer). This insect has made its appearance in certain of the bush fruit districts of Oregon and though at present confined to a limited area will undoubtedly spread and become a serious pest. The authors consider that birds are the best natural enemies of this insect, as they have been observed catching and feeding upon the adult moths. Possibly some sticky substance applied to the canes in early autumn might prevent the larvae after hatching from crawling down the stalks to enter the root. Many of the larvae may be collected in old canes and stumps during June and July.

Epitrix subscrinita, Lec. (Western Potato Flea Beetle). This is one of the very serious pests of the potato in Oregon. The summer generation, which really does the most injury, appears from the second week in July to the first week in August. There

are two generations in the season. The beetles from the autumn brood hibernate as adults and attack the crops in the spring. Spraying with Bordeaux mixture appears to be the only useful remedy. Various other insects are noticed, including *Ceresa bubalus*, F. (Buffalo Tree Hopper), *Notolopus* sp. (Western Canker Worm), *Oedemasia concinna*, S. & A. (Red-humped Apple Caterpillar), *Cacoesia rosana* (Oblique-banded Leaf-roller) and *Polycaon confertus* (Oak Branch Borer).

JEPSON (F. P.). **Some preliminary notes on a Scale-Insect infesting the Banana in Fiji.**—*Dept. Agric. Fiji*, Bull. no. 5, Suva, 1913, 7 pp.

In September 1912 the inspectors of imported vegetable matter at Sydney and Melbourne respectively, called attention to the fact that bananas from Fiji were frequently found to be infested by *Aspidiotus hederae*, Vall., commonly known as Oleander Scale. In consequence of this report bananas in Fiji were inspected for scale before export and scales were found on the stalk-ends of some of the bananas, as well as on the stalk of the bunch and less frequently on the surface of each banana. Fruit from certain localities appeared to be much more seriously affected than from others, but few plantations were found to be free from infection. The scale had also been found in isolated cases on old leaves of Para rubber and commonly on leaves of the Kulava (*Wormia biflora*). This scale has now been definitely determined in Australia to be *Aspidiotus destructor*, Sign., and not *A. hederae* as first reported. It is known as the Transparent Coconut Scale. The species has been recorded as a serious pest of coconuts in Reunion, the Philippines, the Society Islands and the West Indies. The author quotes Banks' description of the insect *in extenso*.

When the Commonwealth of Australia refused admission to scale-infested bananas from Fiji, it was suggested (1) to spray the plants on the plantations; (2) to fumigate the bunches in the punts before shipping or possibly in the steamer itself; and (3) to dip the bunches in some scale-destroying mixture before loading them into the punts. As the Victorian authorities will not permit fruit which is marked with scale, dead or alive, to be offered for public sale, the second and third methods were not applicable to the bananas intended to be shipped to that colony, and it appears that the only method which can be recommended is a systematic course of spraying on the plantations while the plants are growing. Kerosene emulsion and lime-sulphur wash are recommended for this purpose.

NOTICES.

The Review of Applied Entomology is intended to contain, month by month, abstracts of the latest information published concerning insects injurious to man or animals, as the carriers of disease; and to forests, fruit trees, crops or stored merchandise.

The Editor will be glad to receive prompt information of the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion, the adoption of which would increase the usefulness of the Review.

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CONTENTS.